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ABSTRACT

The movement toward small school consolidation was based in part on the presumption that academic achievement was lower in small schools, but the results of a study showed that school size was not significantly related to academic achievement in elementary and secondary schools in New Mexico. To determine the relationship of school size and academic achievement when corrections were made for other possible predictors of achievement, researchers studied enrollment and achievement data for a total of 566 New Mexico schools. They used enrollment figures for the 120th day of school and the "total scale scores" on the Comprehensive Test of Basic Skills for students in grades 5, 8, and 11 in 1978, 1979, 1980, and 1981. Although school size appeared to affect academic achievement when no other variables were considered, size was not significantly related to academic achievement when placed in context with other variables. Results showed that two variables, percentage of students elegible for Title I in the lower grades and the student ethnicity variable in the higher grades, were far more useful predictors of academic achievement in a school than school size. (SB)

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RELATIONSHIP OF SCHOOL ENROLLMENT SIZE TO ACADEMIC ACHIEVEMENT IN NEW MEXICO

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INTRODUCTION

Since the early 1930s there has been a substantial shift from the small schools and small school districts toward larger consolidated schools and districts. Between 1930 and 1972 the number of elementary and secondary schools in the United States dropped from approximately 262,000 to 90,876 and the number of school districts declined from approximately 128,000 to 16,960 (Sher & Tompkin, 1976, p1).

The 1950s and 1960s saw a tremendous push to consolidate small schools. The primary consensus on the part of education professionals was that consolidation was the panacea for almost all the rural and small school problems. The public was told that the very small schools were not cost effective, could not provide quality education for their children, and that consolidation of the smaller schools and districts could overcome both the cost and quality aspects and provide a better learning environment for all children. Because of this perception, many states, including New Mexico, elected to consolidate the smaller schools and districts wherever possible. However, rural parents often objected: they "...did not want their children going to distant, unfamiliar schools, or ... feared the effects of such consolidation on the life and vitality of their individual communities" (Sher & Tompkin, 1976, p.2). School consolidation also brought unexpected social and economic shifts in the rural populations. When small townships or villages lost their schools, they often lost a major portion of their small population as well as their identities. Parents' objections as well as the shifts in rural populations have caused political controversy over whether small schools could remain open. With the political controversy came debates over the optimum size of schools and just how small a school could be and still remain open (when consolidation is a viable option). The focus on school size has usually encompassed two main aspects; (1) the academic achievement of the students and the quality of programs, and (2) the cost per pupil of operating the school. Yet the primary motive when considering whether schools should be consolidated has usually been on the second aspect, per-pupil cost.

Since the early 1970s new factors have entered the complicated political equation. Busing, once considered extremely cost effective, no longer looks as attractive. Further, the "New Federalism" mood, brought in with the Reagan administration, has created the climate in which "Bigger" is not always better. And finally, the Back-to-Basics movement seems to give the appearance that perhaps the "little-Red-School-House" had the right idea on how to teach the students. However, there continues to be lingering doubts by many educators that small schools may not prepare students academically as well as larger schools.

STATEMENT OF PROBLEM

Most arguments against a small school's equality of academic achievement are based on intuitive speculation. This study intends to examine the issue with empirical data and determine if a relationship can be found between school size and academic achievement when correction have been made for other predictors of achievement.

A substantial amount of research has already examined the cost issues in public schools. This study will not consider the cost aspect; instead, this study focuses only on academic achievement of students in the public schools.

There are many measures of academic achievement, but for the purposes of this study, only a school average "total scale score" on the Comprehensive Test of Basic Skills (CTBS) was used.

THE QUESTIONS

The first question to be examined is: Is there a relationship between school enrollment size and student achievement?

To answer this question the study examined the simple correlation of school size with achievement.

The second question to be examined is: Is there a relationship between school enrollment size and student achievement when corrections have been made for certain other predictors of achievement?

To answer the second question, the partial F-value (of school enrollment size) in a regression analysis of variance was used to determine the school size relationship after other variables have been included in the model.

Schools in New Mexico offer a good opportunity to examine these questions. Per-pupil funding of schools in New Mexico is relatively constant, with the state government paying the largest share of the schools operating budget and the local and the Federal government providing only a small percentage of funds.

SCOPE AND DESCRIPTION OF THE VARIABLES

The sample of student test results was limited to grades five, eight and eleven in New Mexico schools. The dependent variable, academic achievement, was the mean "total scale score" for each school as measured on the CTBS test given in years 1978, 1979, 1980, 1981. The independent variable of school enrollment size was the 120th day enrollment figures for each school as provided by the Title I office at the New Mexico State Department of Education.

The control variables were: (1) Percentage of students eligible of Title I programs in the schools (2) The percentage of students in Special education in the district, (3) the pupil/teacher ratio of the district, (4) the average district salary for teachers, (5) the average years of teaching experience of teachers in the district, (6) the percentage of teachers with Masters or higher degrees in the district, (7) the percentage of Spanish-American students in the district, (8) the percentage of Native American students in the district, (9) the mobility rate of students in the district, and (10) the expenditures per pupil in the district.

METHOLODGY

OVERVIEW OF THE ANALYTIC PROCEDURES

The procedure used to answer the first question was the Pearson R correlation of school enrollment size and academic achievement. The procedure used to answer the second question was multiple regression with a partial F-test for the variable school enrollment size. This procedure is explained in "Applied Regression Analysis" by Norman Draper and Harry Smith (1966).

Assumptions.

1. The academic achievement data provided by the New Mexico State Department was accurate.
2. The Total scale score of the CTBS is a valid and reliable measure of academic achievement.
3. The amount of bias in the self-reported data on ethnicity is small.
4. The amount of bias in the measure of all other independent variable is small.
5. The variables reported at the district level were representative and can be used as an appropriate measure for the individual schools.

Data Collection and Recording.

The achievement data was provided on computer tape from the State Department of Education for New Mexico. The data for the number of schools and percentage of students in Title I programs were hand recorded from records on file in the Title I office of the Department of Education in New Mexico. All other data was taken from the School District survey for years 1978, 1979, 1980 and 1981. The computer package used to analysis the data was the Statistical Analysis System (SAS).

The following table lists the number of schools at each grade level for each year that data was available.

TABLE I

NUMBER OF SCHOOLS USED IN THE STUDY

	YEARS			
	1978	1979	1980	1981
GRADE 5	320	323	323	323
GRADE 8	138	138	138	138
GRADE 11	105	105	105	105

RESULTS

RESULTS OF THE FIRST QUESTION

The correlation results of the independent variable school enrollment size versus the dependent variable academic achievement as measured by the total battery on the CTBS is given in table II. For the twelve tests the Pearson's R ranges from R=0.05 to R=0.30 . School size is significant in six of the twelve tests. It can be seen in Table II that in the fifth grade size was significant in two of the four years. In the eighth grade size was not significant in any of the four years and in the eleventh grade size was significant in all four years. But whether school enrollment size is statistically significant after the other independent variables have been accounted for must be determined by the test results that directly follow.

RESULTS OF THE SECOND QUESTION

Table III provides the partial F-value and significance levels of the regression analysis of variance for school enrollment size in the three grade levels and four years.

The results show that there is no statistically significant relationship between school enrollment size and academic achievement as measured by the total battery score on the CTBS in the fifth, eighth, or eleventh grades for years 1978,1979,1980,1981.

TABLE II
CORRELATIONS OF SCHOOLS SIZE WITH ACHIEVEMENT

GRADE		YEAR 1978	1979	1980	1981
GRADE 5					
	R	.10029	.12995	.14137	.10567
	PROB	.0714	.0205	.0112	.0582
	N	(318)	(318)	(321)	(322)
GRADE 8					
	R	.05271	.00503	.15717	.10817
	PROB	.5422	.9540	.0666	.2083
	N	(136)	(134)	(137)	(137)
GRADE 11					
	R	.30169	.22709	.25680	.25930
	PROB	.0020	.0217	.0088	.0085
	N	(103)	(102)	(103)	(102)

TABLE III
PARTIAL F-VALUES AND PROBILITY LEVELS FOR
THE VARIABLE SCHOOL SIZE

	YEAR 1978		1979		1980		1981	
GRADE	F-VALUE	PROB	F-VALUE	PROB	F-VALUE	PROB	F-VALUE	PROB
GRADE 5	0.13	0.717	0.04	0.833	0.01	0.955	0.09	0.338
GRADE 8	0.13	0.715	1.54	0.217	3.49	0.064	0.12	0.735
GRADE 11	3.66	0.059	1.02	0.316	0.08	0.778	2.52	0.116

TABLE IV

COMPLETE MODEL RESULTS

	Grade 5		Grade 8		Grade 11	
	Total R-Sq	Significant Variables	Total R-Sq	Significant Variables	Total R-Sq	Significant Variables
Year 1978	.465	1) Title I 2) Native American	.557	1) Title I 2) Native American 3) Mobility Rate	.611	1) Title I 2) Mobility Rate
Year 1979	.513	1) Title I 2) Native American	.620	1) Title I 2) Teaching Experience 3) Native American	.617	1) Spanish American 2) Native American
Year 1980	.477	1) Title I 2) Special Education	.674	1) Title I 2) Native American	.562	1) Title I 2) Spanish American 3) Native American
Year 1981	.487	1) Title I 2) Special Education 3) Teaching Experience 4) Native American 5) Mobility Rate	.596	1) Title I 2) Special Education 3) Native American	.604	1) Mobility Rate 2) Spanish American 3) Native American

ADDITIONAL FINDINGS OF THE COMPLETE MODEL

Table IV presents the results of the complete model with all eleven variables included.

Summary of Complete Model Results.

The total R-squared values for the COMPLETE model, with all 11 independent variables, ranged from R-squared =0.465 to R-squared =0.674 . In most cases the total model of 11 independent variables accounted for over 50 percent of the variability in the dependent measure of academic achievement.

The F-values for the complete model were all significant at alpha =0.0001 probability. The control variable that appears to have the most influence on the model was percent of students eligible for Title I. The partial F-value of the Title I variable was significant at alpha =0.05 level or lower for ten of the twelve tests. Only in the eleventh grade in years 1979 and 1981 was the value not statistically significant at alpha =0.05 level. Other control variables that were statistically significant (alpha =0.05) in a least one of the models were;

1) Percentage of Native American Students (significant in nine of the models, negative Beta value).

2) Percentage of students enrolled in special education (significant in three of the models, positive Beta value).

3) Percentage of Spanish American students (significant in two of the models, negative Beta value).

4) The mobility rate of the students (significant in three of the models, negative Beta in two cases, positive Beta in one case).

5) Average years of teaching experience (significant in two of the models, positive Beta value).

6) The per pupil expenditure (significant in one of the models, positive Beta value).

7) Pupil/Teacher ratio (significant in one of the models, negative Beta value).

SUMMARY OF RESULTS

Correlation coefficients between school enrollment size and the criterion variable academic achievement ranged from .05 to .30, all coefficients were in the positive direction. These findings somewhat parallel James's (1955) study using rank order correlations. His study showed positive correlations between school size and science achievement, social studies and English achievement. In the current study, the Pearson R correlation coefficients were significant in six of the nine years, and all coefficients were significant at the eleventh grade. From this it might appear that school size plays a larger role in academic achievement in the later years of schooling (High School) than

the earlier years (Elementary and Junior High). Yet the correlation coefficients alone do not provide enough insight into what relationship school size may have with academic achievement. Size must be placed into context with other variables that could influence academic achievement. Therefore twelve multiple regression models were examined.

After examining the twelve multiple regression models, it was determined that, in all cases, school enrollment size could not be shown to be significantly related to academic achievement. From the available data there is no reason to believe that school enrollment size is related to academic achievement when other variables such as percentage of Title I students, percentage of Native American students, percentage of Spanish American students, mobility rate, per pupil expenditure, average years of teaching experience, and pupil/teacher ratio are included in the model.

CONCLUSIONS:

1. From the data in this study there is no reason to believe that school enrollment size is related to academic achievement when corrections have been made for other variables related to achievement. It appears that other variables, listed in the study, are far more useful in predicting achievement than school size.

2. The percentage of students eligible for Title I and the ethnicity variable (percentage of Native American students) appears to contribute significantly to academic achievement, far more than any other variables examined in this study.

3. The percentage of students eligible for Title I appears to be the primary significant variable in the early years (Elementary and Junior High) of education. In the later years, the ethnicity variables (percentage of Native American students and percentage of Spanish American students) appear to be the primary significant variables with Title I no longer being of primary importance.

RECOMMENDATIONS FOR PRACTICE

1. Policy makers should be aware that academic achievement is probably not related to school enrollment size, and that if they wish to improve academic achievement they need to examine the social-economic and ethnicity variables when developing new programs.

2. Since ethnicity is a variable that cannot be controlled, it would appear that intense programs to improve academic achievement be stressed in the lower grades where they will have more of an impact.

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